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SHORT REPORT

Nosocomial infections in the ICU: Pens and spectacles as fomitesHaris Farooq Murad,¹ Khawaja Mohammad Inam Pal²**Abstract**

Nosocomial infections are a major cause of morbidity and mortality. Non-medical objects known as fomites may have a role in their genesis. We investigated the significance of writing pens and spectacles as fomites. The study was conducted at Aga Khan University Hospital, Karachi, from July 2013 to September 2013. Cultures were taken from pens and/or spectacles of resident nurses, doctors and nursing assistants in intensive care unit (ICU). Organisms important in ICU nosocomial infections were targeted. Seven rounds of sampling over 3 weeks led to 55 pen and 5 spectacle samples. Growth was seen in 3(5.5%) pen samples and 1(20%) spectacle sample. Two (3.6%) pen cultures grew acinetobacter, 1(1.8%) grew candida and acinetobacter, and 1 spectacle culture grew vancomycin-resistant enterococcus faecium (VRE). Two out of the 4 (50%) personnel managing all ICU beds had growth. During the study, one or more ICU patients had infection with the same organisms. Pens and spectacles may be responsible for the spread of organisms like acinetobacter and VRE. Personnel managing multiple beds are more likely to carry contaminated fomites.

Keywords: Fomites, Nosocomial infections, Acinetobacter, Vancomycin resistant Enterococcus.

Introduction

Nosocomial infections are a major cause of morbidity and mortality.¹ The International Nosocomial Infection Control Consortium (INICC) surveillance from 2002 through 2006 pointed to high rates of such infections in the intensive care units (ICUs) of limited-resource countries. Rates of device-associated nosocomial infections, central line associated bloodstream infections (CLABI), ventilator-associated pneumonia (VAP), catheter-associated urinary tract infection (CAUTI) were 3 to 5 times that of ICUs in the United States.² Furthermore, multi-drug resistant strains are increasingly responsible for these infections.^{3,4}

Bacterial contamination of ubiquitous objects, such as pens, identification (ID) cards and writing surfaces, which are known as fomites, have an established role in the

spread of these infections.⁵⁻⁷

We planned the study to investigate the significance of some of these fomites in our own ICU environment. Similar studies addressing the role of pens in this respect have been done in the past with varied results.^{5,8} However, to our knowledge, no major study has as yet explored the potential of spectacles carriers. We believe both of these objects are commonly overlooked as sources of infection as they are not routinely disinfected.

Methods and Results

The study was conducted at Aga Khan University Hospital, Karachi, from July 2013 to September 2013. Our subjects were medical personnel in the mixed adult ICU. The facility has 17 beds in 11 rooms; 9(82%) rooms with 1 bed and 2(18%) with 4 beds. Approximately 23 people are involved with patients in the ICU at a time; there are 3 eight-hour shifts a day. During each shift every bed has one resident nurse dedicated to it. Helping the nurses are 3 to 4 nursing assistants, responsible usually for more than one bed. Two to three resident doctors with a consultant are looking after all the patients. Overall, the ICU employs a total of 45 resident nurses, 10 assistant nurses and 5 resident doctors.

Following approval from the institutional review committee and submission of consent from the subjects, culture swabs from the surface of writing pen and/ or daily use spectacles were taken. For the latter, the side corresponding to the dominant hand was cultured. Before taking culture, the swabs were moistened with the transport medium. Standard environmental culture techniques used in microbiology lab were followed to maximise yield of medically important bacteria.

Not more than one sample was taken from each worker, even on a different day. To maximise yield, samples were taken towards the end of each shift.

The culture swabs were transported in Amies transport medium; two sets of cultures were made. One directly inoculated on sheep blood agar (for gram-positive organisms), McConkeys agar (a differential medium for enterobacteriaceae) and Sabouraud's agar (for fungi). Incubation was done at 37°C for 72 hours. The same swabs were also used in the second set of cultures, which were

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Table: Positive culture results and healthcare worker information.

| Sampling Day | Type of object | Organism grown | Number of beds attended | Shift |
|--------------|----------------|---------------------------|-------------------------|---------|
| 1 | Pen | Acinetobacter and Candida | 1 | Morning |
| 5 | Pen | Acinetobacter | All | Evening |
| 5 | Pen | Acinetobacter | All | Evening |
| 6 | Spectacle | VRE* | 1 | Evening |

*Vancomycin-resistant E.Coli.

incubated in brain heart infusion (BHI) for 18 hours. Then they too were inoculated on sheep blood, Sabouraud's and McConkeys agar. This was done to increase the yield.

We looked only for organisms that were of significance in ICU nosocomial infections, namely: staphylococcus aureus, enterococcus, acinetobacter, pseudomonas aeruginosa, E. coli, klebsiella and fungal species (candida, aspergillus and mucor).

During each round of sampling 8-9 samples, about 35-39% of shift staff, were taken. Seven rounds on different days were done.

For each sample taken, the culture profile of the patient being looked after was noted.

Of the 60 ICU medical staff members, 54(90%) participated. These comprised all 45(100%) resident nurses, 7(70%) of the 10 nursing assistants, and 3(60%) of the 5 resident doctors.

Of the 60 culture swabs, 55(92%) were from pens and 5(8%) were from spectacles. The reason for low spectacle numbers was smaller user cohort.

Three (5.5%) of the pen samples and 1(20%) spectacle showed growth. The samples were taken on 3 separate days; 1(25%) positive result on the first day of sampling, 2(50%) on the fifth, and 1(25%) on the sixth day.

Two (3.6%) of the pen cultures grew acinetobacter, 1(1.8%) grew candida along with acinetobacter, and the spectacle culture grew vancomycin-resistant enterococcus (VRE) faecium.

Of the 55 subjects, 44(80%) were looking after one bed, 6(11%) were assigned to two beds, and 4(7%) were assigned to look after all the ICU beds. Two of the 44(4.5%) subjects managing one bed were positive, none of the 6 managing 2 beds showed growth, while 2 out of 4 (50%) managing all beds showed growth (Table).

We could not demonstrate a correlation between the growth from specific staff and the patients they were managing. However, for each day of positive results, there were patients in ICU with the same infecting organism.

Three patients in ICU had acinetobacter on the first day, one with acinetobacter on the 5th day and two patients with VRE on the 6th day.

Conclusion

Hospitals worldwide, including those in developing countries, have taken steps to prevent nosocomial infections, including contact precautions and disinfection procedures. Despite adopting such policies in our hospital, 3 of our pen samples and 1 spectacle (5.5% and 20% respectively) was contaminated with organisms known to cause nosocomial infections.

Acinetobacter, a gram-positive coccobacillus, is rapidly emerging as an organism of major importance in hospitals all over the world. It is known for its propensity to cause outbreaks, antimicrobial resistance and resistance to desiccation.⁹ It commonly causes hospital-acquired pulmonary, blood stream, urinary tract and surgical wound infections.⁹ The findings of the International Nosocomial Infection Control Consortium (INICC) surveillance on ICUs in 36 developing countries found acinetobacter to be one of the major pathogens responsible for most nosocomial infections. The organism's high resistance to desiccation is one of the important factors for dissemination.¹⁰

One spectacle sample grew VRE which frequently causes epidemics in various hospital settings and in fact has been reported to be endemic in many hospitals in the past.¹¹ Infections caused by VRE include urinary tract and bloodstream infections, endocarditis and meningitis.

It is also interesting to note that 2 of the 4 people (50%) looking after all the ICU beds had pens that were contaminated compared to a contamination rate of 4.5% amongst those who were looking after just one bed. Potentially these workers could be responsible for transmission to multiple patients. Healthcare workers with such roles are usually on-call doctors or attending physicians.

The best measure that one can take is of course regular hand-washing not only before and after patient contact, but also before touching any objects like writing pens. The

INICC survey reported a hand hygiene compliance rate of 60.6% amongst healthcare workers in developing countries, which is unacceptably low.¹² It has been reported that physicians have amongst the lowest rates of hand hygiene compliance which could also explain why the healthcare workers looking after all the beds had a 50% contamination rate of their pens. It will certainly also be very beneficial if writing pens and spectacles are regularly decontaminated, just like stethoscopes and other medical instruments.

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